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JC853 U.S. PTO 06/14/00

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PTO/SB/50 (4/98)
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REISSUE PATENT APPLICATION TRANSMITTAL

JC548 U.S. PTO 09/594555 06/14/00

Address to:
Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

Attorney Docket No.	226/132
First Named Inventor	Robert C. Dixon
Original Patent Number	5,850,600
Original Patent Issue Date (Month/Day/Year)	12/15/98
Express Mail Label No.	EL524788042US

APPLICATION FOR REISSUE OF: (check applicable box) [X] Utility Patent [ ] Design Patent [ ] Plant Patent

APPLICATION ELEMENTS

1. [X] * Fee Transmittal Form *(PTO/SB/56)* *(Submit an original, and a duplicate for fee processing)*
2. [X] Specification and Claims (*amended, if appropriate*)
3. [X] Drawing(s) *(proposed amendments, if appropriate)*
4. [X] Reissue Oath / Declaration (original or copy) *(37 C.F.R. § 1.175)(PTO/SB/51 or 52)*
5. Original U.S. Patent
   - [X] Offer to Surrender Original Patent *(37 C.F.R. § 1.178)* *(PTO/SB/53 or PTO/SB/54)*
   - or
   - [ ] Ribboned Original Patent Grant
   - [ ] Affidavit / Declaration of Loss *(PTO/SB/55)*
6. Original U.S. Patent currently assigned?
   - [X] Yes [ ] No

   (If Yes, check applicable box(es))
   - [X] Written Consent of all Assignees *(PTO/SB/53 or 54)*
   - [X] 37 C.F.R. § 3.73(b) Statement [ ] Power of Attorney

ACCOMPANYING APPLICATION PARTS

7. [ ] Foreign Priority Claim *(35 U.S.C. 119)* *(if applicable)*
8. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
9. [ ] English Translation of Reissue Oath/Declaration *(if applicable)*
10. [ ] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
11. [ ] Preliminary Amendment
12. [ ] Return Receipt Postcard *(MPEP 503)* *(Should be specifically itemized)*
13. [ ] Other: .....

** NOTE FOR ITEMS 1 & 10: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).*

14. CORRESPONDENCE ADDRESS

[ ] Customer Number or Bar Code Label **22249** (Insert Customer No. or Attach bar code label here) or [ ] Correspondence address below

PATENT TRADEMARK OFFICE

Name	Lyon & Lyon LLP				
Address	633 West Fifth Street, 47th Floor				
City	Los Angeles	State	CA	Zip Code	90071-2066
Country	U.S.A.	Telephone	(408) 993-1555	Fax	(408) 287-2664

NAME (Print/Type)	Steven D. Hemminger	Registration No. (Attorney/Agent)	30,755
Signature		Date	6/14/00

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Express Mail #EL524788042US
Docket No. 226/132
June 14, 2000

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REISSUE APPLICATION FEE TRANSMITTAL FORM

Docket Number (Optional): 226/132

Claims as Filed - Part 1

Claims in Patent	For	Number Filed in Reissue Application	(3) Number Extra	Small Entity Rate	Small Entity Fee		Other than a Small Entity Rate	Other than a Small Entity Fee
(A) 20	Total Claims (37 CFR 1.16(j))	(B) 25	**** 5 =	x $___ =		or	18 x $___ =	90.00
(C) 3	Independent Claims (37 CFR 1.16(i))	(D) 5	* 2 =	x $___ =		or	78 x $___ =	156.00
			Basic Fee (37 CFR 1.16(h))		$___			$ 690.00
			Total Filing Fee		$		OR	$ 936.00

Claims as Amended - Part 2

	(1) Claims Remaining After Amendment		(2) Highest Number Previously Paid For	(3) Extra Claims Present	Small Entity Rate	Small Entity Fee		Other than a Small Entity Rate	Other than a Small Entity Fee
Total Claims (37 CFR 1.16(j))	***	MINUS	**	* =	x $___ =		or	x $___ =	
Independent Claims (37 CFR 1.16(i))	***	MINUS	*****	=	x $___ =		or	x $___ =	
				Total Additional Fee		$		OR	$

* If the entry in (D) is less than the entry in (C), Write "0" in column 3.
** If the "Highest Number of Total Claims Previously Paid For" is less than 20, Write "20" in this space.
*** After any cancelation of claims
**** If "A" is greater than 20, use (B -A); if "A" is 20 or less, use (B - 20).
***** "Highest Number of Independent Claims Previously Paid For" or Number of Independent Claims in Patent (C).

☐ Please charge Deposit Account No. _____ in the amount of _____.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any additional fees under 37 CFR 1.16 or 1.17 which may be required, or credit any overpayment to Deposit Account No. 12-2475.
A duplicate copy of this sheet is enclosed.

☒ A check in the amount of $ 936.00 to cover the filing / additional fee is enclosed.

6/14/00
Date

Signature of Applicant, Attorney or Agent of Record

Steven D. Hemminger
Typed or printed name

Express Mail #EL524788042US
Docket No. 226/132
June 14, 2000

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REISSUE APPLICATION BY THE INVENTOR, OFFER TO SURRENDER PATENT

Docket Number (Optional) 226/132

This is part of the application for a reissue patent based on the original patent identified below.

Name of Patentee(s) Robert C. Dixon

Patent Number 5,850,600 | Date Patent Issued 12/15/1998

Title of Invention
Three Cell Wireless Communication System

I am the inventor of the original patent.

I offer to surrender the original patent.

1. [X] Filed herein is a certificate under 37 CFR 3.73(b).

2. [ ] Ownership of the patent is in the inventor(s), and no assignment of the patent has been made.

One of boxes 1 or 2 above must be checked.

The written consent of all assignees owning an undivided interest in the original patent is included in this application for reissue.

Signature Robert C. Dixon | Date 4-5-00

Typed or printed name
Robert C. Dixon

The assignee owning an undivided interest in said original patent is Omnipoint Corporation, and the assignee consents to the accompanying application for reissue.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application, any patent issued thereon, or any patent to which this declaration is directed.

Name of assignee
OMNIPOINT CORPORATION

Signature of person signing for assignee | Date 5/30/00

Typed or printed name and title of person signing for assignee
David A. Miller, Vice President and Assistant Secretary

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Express Mail #EL524788042US
Docket No. 226/132
June 14, 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Robert C. Dixon

U.S. Patent No.: 5,850,600

Filed: June 16, 1997
Issued: December 15, 1998

For: THREE CELL WIRELESS COMMUNICATION SYSTEM

Group Art Unit [Issued Patent]: 2745

Examiner [Issued Patent]: Banks-Harold, M.

CONSENT TO THE REISSUE BY THE ASSIGNEE

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

OMNIPOINT CORPORATION, assignee of U.S. Patent No. 5,850,600, consents to the filing of the present application for the reissue of U.S. Patent No. 5,850,600.

Dated: ~~April~~ MAY 30, 2000

By: _____
David A. Miller
Vice President and Assistant Secretary
Omnipoint Corporation

DOCKET INFORMATION
192/270

POWER OF ATTORNEY

OMNIPOINT DATA COMPANY, INC., assignee(s) of the application for United States Letters Patent for an improvement in "THREE CELL WIRELSS COMMUNICATION SYSTEM" (Title),

by ROBERT C. DIXON (Inventors)

☐ executed on even date herewith, or

☒ having Serial No. 07/682,050 filed April 8, , 1991.

a copy of the assignment of which is attached hereto, do(es) hereby appoint as attorneys of record with full power of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Roland N. Smoot, Reg. No. 18,718; Conrad R. Solum, Jr., Reg. No. 20,467; James W. Geriak, Reg. No. 20,233; Robert M. Taylor, Jr., Reg. No. 19,848; Samuel B. Stone, Reg. No. 19,297; Douglas E. Olson, Reg. No. 22,798; Robert E. Lyon, Reg. No. 24,171; James J. Short, Reg. No. 25,922; Robert C. Weiss, Reg. No. 24,939; William E. Thomson, Jr., Reg. No. 20,719; Richard E. Lyon, Jr., Reg. No. 26,300; John D. McConaghy, Reg. No. 26,773; William C. Steffin, Reg. No. 26,811; Coe A. Bloomberg, Reg. No. 26,605; J. Donald McCarthy, Reg. No. 25,119; John M. Benassi, Reg. No. 27,483; James H. Shalek, Reg. No. 29,749; Allan W. Jansen, Reg. No. 29,395; Robert W. Dickerson, Reg. No. 29,914; Kenneth D'Alessandro, Reg. No. 29,144; Roy L. Anderson, Reg. No. 30,240; David B. Murphy, Reg. No. 31,125; Bradford J. Duft, Reg. No. 32,219; James C. Brooks, Reg. No. 29,898; Jeffrey M. Olson, Reg. No. 30,790; and STEVEN A. SWERNOFSKY Reg. No. 33,040

Send Correspondence to: LYON & LYON, 34th Floor, 611 W. Sixth St., Los Angeles, CA 90017

Direct Telephone Calls to: Steven A. Swernofsky (213) 489-1600 x323

I the undersigned, declare that I am the (an) assignee of the above-identified application or, if the assignee is a corporation, partnership or other association, I am authorized to make this appointment on behalf of the assignee and I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full Name of Assignee: OMNIPOINT DATA CO., INCORPORATED	
Post Office Address: 242 Marlboro Street, Boston, MA 02116	
Signature of Declarant or Assignee: X Evelyn Goldfine	Date: X May 30, 1991

Full Name of Assignee	
Post Office Address	
Signature of Assignee	Date

Full Name of Declarant If Other Than Assignee
Title of Declarant
Address of Declarant

Express Mail #EL524788042US
Docket No. 226/132
June 14, 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Group Art Unit [Issued Patent]: 2745
	)	
Robert C. DIXON	)	Examiner [Issued Patent]:
	)	Banks-Harold, M.
U.S. Patent No. 5,850,600	)	
	)	
Filed: June 16, 1997	)	
Issued: December 15, 1998	)	
	)	
For: THREE CELL WIRELESS	)	
COMMUNICATION SYSTEM	)	
	)	

STATEMENT UNDER 37 C.F.R. §3.73(b)

Sir or Madam:

Attached herewith are documents evidencing a chain of title which establishes that OMNIPOINT CORPORATION is the present assignee of U.S. Patent No. 5,850,600. This patent is a continuation of Serial No. 410,901, filed March 27, 1995, now U.S. Patent No. 5,640,674, which in turn is a continuation of Serial No. 682,050, filed April 8, 1991, now U.S. Patent No. 5,402,413.

Exhibit A is a copy of the original assignment recorded for the grandparent of the present application, Serial No. 682,050, now U.S. Patent No. 5,402,413, which was recorded in the PTO on June 10, 1991 at Reel 5747, Frame 081.

Exhibit B is a copy of the PTO Notice of Assignment Recordation of the above document.

Exhibit C is a copy of the Change of Name and Address of Assignee from Omnipoint Data Company to Omnipoint Corporation recorded for the parent of the present application, Serial No. 410,901, now U.S. Patent No. 5,640,674, which was recorded in the PTO on August 20, 1996 at Reel 8095, Frame 0429.

Exhibit D is a copy of the PTO Notice of Assignment Recordation of the above document.

Exhibit E is a copy of the Power of Attorney filed with this reissue application.

Respectfully submitted,

LYON & LYON LLP

Date: June 14, 2000

By: [signature]
Steven D. Hemminger
Reg. No. 30,755
Attorneys for Applicant

633 W. Fifth Street, Suite 4700
Los Angeles, CA 90071-2066
Tel. (408) 993-1555
Fax. (408) 287-2664

Express Mail #EL524788042US
Docket No. 226/132
June 14, 2000

192/270
PATENT

A S S I G N M E N T

WHEREAS, **ROBERT C. DIXON**, a citizen of the United States, having a post office address at 2120 Hollowbrook Dr., Colorado Springs, CO 80918, invented a new and useful invention, titled **"THREE CELL WIRELESS COMMUNICATION SYSTEM"**, for which I have filed application papers for United States Letters Patent thereon, Serial No. 07/682,050, filed April 8, 1991; and

WHEREAS, **OMNIPOINT DATA CO., INCORPORATED**, a corporation of the United States, having its principal place of business at 242 Marlboro Street, Boston, MA 02116, is desirous of acquiring the exclusive right, title and interest in and to said invention and in and to the Letters Patent to be granted and issued therefor:

NOW, THEREFORE, for a valuable consideration the receipt of which is hereby acknowledged, I, the said inventor do hereby sell, assign, transfer, and set over unto the said **OMNIPOINT DATA CO., INCORPORATED**, its successors and assigns, the full and exclusive right, title, and interest in and to the said invention, and in and to any and all Letters Patent to be granted and issued therefor, in the United States of America, its territories and possessions, including all priority rights under

the International Convention; and I hereby authorize and request the Commissioner of Patents and Trademarks to issue said Letters Patent to said **OMNIPOINT DATA CO., INCORPORATED**, it's successors and assigns, in accordance with this Assignment.

Executed at Colorado Springs, Colorado, this 24th day of May, 1991.

By Robert C. Dixon
Robert C. Dixon

STATE OF ~~CALIFORNIA~~ COLORADO)
) ss.
COUNTY OF El Paso)

On this 24th day of May, 1991, before me, a Notary Public, personally appeared **ROBERT C. DIXON**, known to me to be the person whose name is subscribed to the within instrument, and acknowledged that he executed the same.

Rina Marie Urbaneak
Notary Public in and for said County and State

UNITED S[illegible]ES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

DATE: 08/12/91
TO:
STEVEN A. SWERNOFSKY
611 W. SIXTH ST., 34TH FL.
LOS ANGELES, CA 90017

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ASSIGNOR: DOC DATE: 05/24/91
DIXON, ROBERT C.

RECORDATION DATE: 06/10/91 NUMBER OF PAGES 003 REEL/FRAME 5747/0080

DIGEST :ASSIGNMENT OF ASSIGNORS INTEREST

ASSIGNEE:
OMNIPOINT DATA CO., INCORPORATED
242 MARLBORO STREET
BOSTON, MASSACHUSETTS 02116

SERIAL NUMBER 7-682050 FILING DATE 04/08/91
PATENT PATENT ISSUE DATE 00/00/00

MRD 8/20/96

OIPE NOV 17 1997 PATENT & TRADEMARK OFFICE

AUG [illegible] 1993 RECEIPT ACCTNG DIV

581/40

08-23-1996

100259327

FORM PTO-1595
(Rev. 6-93)
OMB No. 0651-0011 (exp. 4/94)
Tab settings ⇨ ⇨ ⇨ ▼

SHEET

U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

211/241

To the Honorable Commissioner: [illegible] ached original documents or copy thereof.

1. Name of conveying party(ies):

Omnipoint Data Company, Incorporated

Additional name(s) of conveying party(ies) attached? ☐ Yes ☒ No

2. Name and address of receiving party(ies)

Name: Omnipoint Corporation

Internal Address: _____

Street Address: 1365 Garden of the Gods Road

City: Colorado Springs State: CO ZIP: 80907

Additional name(s) & address(es) attached? ☐ Yes ☒ No

3. Nature of conveyance:

☐ Assignment ☐ Merger

☐ Security Agreement ☐ Change of Name

☒ Other Change of Name and Address of Assignee effective July 29, 1993

Execution Date: _____

4. Application number(s) or patent number(s): 08/410,901

If this document is being filed together with a new application, the execution date of the application is: _____

A. Patent Application No.(s)

08/410,901

B. Patent No.(s)

Additional numbers attached? ☐ Yes ☒ No

5. Name and address of party to whom correspondence concerning document should be mailed:

Name: Steven D. Hemminger

Internal Address: LYON & LYON

Street Address: 633 West Fifth Street

Suite 4700

City: Los Angeles State: CA ZIP: 90071

6. Total number of applications and patents involved: 1

7. Total fee (37 CFR 3.41).....$ 40.00

☒ Enclosed

☒ Authorized to be charged to deposit account

8. Deposit account number:

12-2475

(Attach duplicate copy of this page if paying by deposit account)

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9. Statement and signature.

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Steven D. Hemminger
Name of Person Signing

Signature

August 14, 1996
Date

Total number of pages including cover sheet, attachments, and document: 8

Mail documents to be recorded with required cover sheet information to:
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Docket No. 226/132
June 14, 2000

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DECEMBER 01, 1997

PTAS

LYON & LYON
STEVEN D. HEMMINGER
633 WEST FIFTH STREET
SUITE 4700
LOS ANGELES, CA 90071

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RECORDATION DATE: 08/20/1996

REEL/FRAME: 8095/0429
NUMBER OF PAGES: 6

BRIEF: CHANGE OF NAME AND ADDRESS OF ASSIGNEE EFFECTIVE JULY 29, 1993

ASSIGNOR:
OMNIPOINT DATA COMPANY,
INCORPORATED

DOC DATE: 07/29/1993

ASSIGNEE:
OMNIPOINT CORPORATION
1365 GARDEN OF THE GODS ROAD
COLORADO SPRINGS, COLORADO 80907

SERIAL NUMBER: 08410901
PATENT NUMBER: 5640674

FILING DATE: 03/27/1995
ISSUE DATE: 06/17/1997

MARGARET LASALLE, PARALEGAL
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

THREE CELL WIRELESS COMMUNICATION SYSTEM

This application is a continuation of application Ser. No. 08/410,901 filed Mar. 27, 1995 now U.S. Pat. No. 5,640,676, which is a continuation in part of application Ser. No. 07/682,050 filed Apr. 8, 1991, now U.S. Pat. No. 5,402,413.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to cellular radio communication. More specifically, this invention relates to a cellular radio communication system including a repeated pattern of three cells.

2. Description of Related Art

In a wireless communication system it is generally necessary for a receiver to distinguish between those signals in its operating region that it should accept and those it should reject. A common method in the art is frequency division (FDMA), in which a separate frequency is assigned to each communication channel. Another common method in the art is time division (TDMA), in which a separate timeslot in a periodic time frame is assigned to each communication channel.

One problem which has arisen in the art is that contiguous coverage of a large area using radio communication has required a cellular configuration with a large number of cells, and thus with only a small number of frequencies available per cell. In an FDMA system, all relatively proximate cells, not just adjacent cells, must operate on different frequencies, and frequencies may be reused only sufficiently far away that stations using those frequencies no longer interfere. In general, with homogenous conditions and equal-power transmitters, the distance between perimeters of like-frequency cells must be at least two to three times the diameter of a single cell. This had led to a seven-cell configuration now in common use for cellular networks.

Another problem which has arisen in the art when the cells are disposed in a three-dimensional configuration, particularly in low-power applications where many transmitters are in close proximity. In addition to avoiding interference from close transmitters, these systems may require complex techniques for handing off mobile stations from one cell to another, and for reassigning unused frequencies. This makes the physical location of each cell's central station critical, and thus requires careful coordination of an entire communication system layout.

U.S. Pat. No. 4,790,000 exemplifies the art.

Accordingly, an object of this invention is to provide a wireless communication system including a pattern having a reduced number of cells. Other and further objects of this invention are to provide a communication system which is less complex, which allows for reduced cell size, which can easily be extended from a two-dimensional to a three-dimensional configuration, which can reject interference, and which allows independent installation of multiple communication systems.

SUMMARY OF THE INVENTION

The invention provides a wireless communication system including a repeated pattern of cells, in which base station transmitters and user station transmitters for each cell may be assigned a spread-spectrum code for modulating radio signal communication in that cell. Accordingly, radio signals used in that cell are spread across a bandwidth sufficiently

wide that both base station receivers and user station receivers in an adjacent cell may distinguish communication which originates in one cell from another. (Preferably, adjacent cells may use distinguishable frequencies and distinguishable codes, but it is sufficient if adjacent cells use distinguishable frequencies and identical codes.) A repeated pattern of cells allows the codes each to be reused in a plurality of cells.

In a preferred embodiment, a limited number (three is preferred) of spread-spectrum codes may be selected for minimal cross-correlation attribute, and the cells may be arranged in a repeated pattern of three cells, as shown in FIG. 1. Station ID information may be included with data communication messages so that base stations and user stations may distinguish senders and address recipients. Mobile user stations may be handed off between base stations which they move from one cell to the next.

In a preferred embodiment, codes may be assigned dynamically for each cell by each of a plurality of independent communication systems, after accounting for use by other systems. Preferably, if a control station for a second system determines that two codes are in use closest to it, it may select a third code for use in its nearest cell, and dynamically assign codes for other cells to account for that initial assignment. A control station for the first system may also dynamically reassign codes to account for the presence of the second system. Preferably, this technique may also be applied to a three-dimensional configuration of cells.

In a preferred embodiment, time division and frequency division reduce the potential for interference between station transmitters. In a preferred embodiment, each independent communication system may dynamically assign (and reassign) a frequency or frequencies to use from a limited number (three is preferred) of frequencies, after accounting for use by other systems, similarly to the manner in which codes are dynamically assigned and reassigned from a limited number of codes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a repeated pattern of three cells.

FIG. 2 shows a wireless communication system.

FIG. 3 shows a region with a plurality of independent communication systems.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a repeated pattern of three cells.

FIG. 2 shows a wireless communication system.

A wireless communication system **201** for communication among a plurality of user stations **202** includes a plurality of cells **203**, each with a base station **204**, typically located at the center of the cell **203**. Each station (both the base stations **204** and the user stations **202**) generally comprises a receiver and a transmitter.

In a preferred embodiment, a control station **205** (also comprising a receiver and a transmitter) manages the resources of the system **201**. The control station **205** assigns the base station **204** transmitters and user station **202** transmitters in each cell **203** a spread-spectrum code for modulating radio signal communication in that cell **203**. Accordingly, radio signals used in that cell **203** are spread across a bandwidth sufficiently wide that both base station **204** receivers and user station **202** receivers in an adjacent cell **206** may distinguish communication which originates in the first cell **203** from communication which originates in the adjacent cell **206**.

Preferably, adjacent cells 203 may use distinguishable frequencies and distinguishable codes, but it is sufficient if adjacent cells 203 use distinguishable frequencies and identical codes. Thus, cells 203 which are separated by an intervening cell 203 may use the same frequency and a distinguishable code, so that frequencies may be reused in a tightly packed repeated pattern. As noted herein, spread-spectrum codes which are highly orthogonal are more easily distinguishable and therefore preferred.

The cells 203 may be disposed in the repeated pattern shown in FIG. 1. A cell 203 will be in one of three classes: a first class A 207, a second class B 208, or a third class C 209. No cell 203 of class A 207 is adjacent to any other cell 203 of class A 207, no cell 203 of class B 208 is adjacent to any other cell 203 of class B 208, and no cell 203 of class C 209 is adjacent to any other cell 203 of class C 209. In a preferred embodiment, three spread-spectrum codes may be preselected, such as for minimal cross-correlation attribute, and the such code assigned to each class of cells 203.

However, it would be clear to one of ordinary skill in the art, after perusal of the specification, drawings and claims herein, that alternative arrangements of the cells 203 would also be workable. For example, the cells 203 might be arranged in a different pattern. Alternatively, each base station 204 and each user station 202 may be assigned a separate code, which may then be used to identify that station. Hybrids between these two extremes, such as assigning a common code to a designated class of stations, may be preferred where circumstances indicate an advantage. It would be clear to one of ordinary skill in the art, that such alternatives would be workable, and are within the scope and spirit of the invention.

In a preferred embodiment, only a single code is used for all base stations 204 and user stations 202 in a single cell 203. A message 210 which is transmitted by a base station 204 or a user station 202 may comprise a portion 211 which comprises station ID information, such as a unique ID for the transmitting station. This allows base stations 204 and user stations 202 to distinguish the sender and to address the recipient(s) of the message 210.

When a mobile user station 202 exits the first cell 203 and enters the adjacent cell 206, the user station 202 is "handed off" from the first cell 203 to the adjacent cell 206, as is well known in the art. Determining when the user station 202 should be handed off may be achieved in one of several ways, including measures of signal strength, bit error rate, cross-correlation interference, measurement of distance based on arrival time or position locationing, and other techniques which are well known in the art. Alternatively, the mobile user station 202 may simply lose communication with the base station 204 for the first cell 203 and re-establish communication with the base station 204 for the adjacent cell 206, also by means of techniques which are well known in the art.

FIG. 3 shows a region with a plurality of independent communication systems.

In a preferred embodiment, a single region 301 may comprise both a first system 302 and a second system 303 for wireless communication. The cells 203 of the first system 302 will be distinct from the cells 203 of the second system 303. Rather than disposing the cells 203 of either the first system 302 or the second system 303 in repeated patterns which may clash, the cells 203 each may have a code which is dynamically assigned (or reassigned), with the first system 302 accounting for use by the second system 303 and vice versa.

In a preferred embodiment, the first system 302 may assign a code to each of the cells 203 based on a limited set of codes and a repeated pattern such as that in FIG. 1. The second system 303 may then determine those codes in the limited set which are in closest use to the control station 205 for the second system 303. The second system 303 may then select one of the remaining codes, and assign the selected code to the cell 203 comprising its control station 205. The control station 205 for the second system 303 may then assign a code to each of the cells 203 in the second system 303 based on the same limited set of codes and a repeated pattern such as that in FIG. 1. In a preferred embodiment, the limited set may comprise three codes, and up to two such closest codes may be determined.

More generally, the first system 302 and the second system 303 may each assign a code to each of the cells 203 in their respective systems, based on a limited set of common codes. For each of the cells 203, either the first system 302 or the second system 303 will manage the base station 204 for that cell 203, and thus be in control of that cell 203. The system in control of that cell 203 may dynamically determine those codes from the limited set which are in closest use to the base station 204 for the cell 203, select one of the remaining codes, and assign the selected code to the cell 203.

It would be clear to one of ordinary skill in the art, after perusal of the specification, drawings and claims herein, that application of the disclosed techniques for dynamic assignment (and reassignment) of codes to cells 203 to a three-dimensional configuration of cells 203, would be workable, and is within the scope and spirit of the invention.

In a preferred embodiment, time division is also used. A pulsed-transmitter based system, a minimized number of pulses, and a minimized duration of each pulse reduce the probability of collisions, as is well known in the art. Multiple transmitters may thus all use the same code and the same frequency, as is well known in the art.

In a preferred embodiment, frequency division is also used. Three techniques are disclosed; the third is a preferred embodiment for many envisioned environments. However, it would be clear to one of ordinary skill in the art, after perusal of the specification, drawings and claims herein, that other techniques would be workable, and are within the scope and spirit of the invention. It would also be clear to one of ordinary skill that these techniques may be used with spread-spectrum frequency offset techniques instead of frequency division.

(1) If the region 301 comprises only the first system 302 alone, two frequencies may be used. All of the base stations 204 use a first frequency, while all of the user stations 202 use a second frequency. Accordingly, all of the base stations 204 can receive signals from all of the user stations 202, but the use of multiple sufficiently orthogonal spread-spectrum codes allows each base station 204 to reject signals from outside its own cell 203. (Spread-spectrum codes which are highly orthogonal are preferred.) The first frequency and the second frequency must be sufficiently separated so that interference does not occur.

(2) If the region 301 comprises both the first system 302 and the second system 303, frequencies may be assigned dynamically. All of the base station 204 transmitters in each system use a first frequency, selected from a limited set. All of the user station 202 transmitters in each system use a second frequency, also selected from a limited set, not necessarily the same set. Moreover, each system may dynamically assign and reassign frequencies in like manner

as disclosed above for dynamic assignment and reassignment of codes. In like manner as to codes, in a preferred embodiment, the limited set may comprise three frequencies, and up to two such closest frequencies may be determined.

(3) If the region **301** comprises both the first system **302** and the second system **303**, frequencies may be assigned dynamically. All of the base station **204** transmitters and all of the user station **202** transmitters in each cell **203** use a single frequency, selected from a limited set. Each base station **204** dynamically determines those frequencies from the limited set which are in closest use to it, and selects one of the remaining frequencies for use in the cell **203**. The base station **204** transmitters and the user station **202** transmitters may be time-division duplexed. (Time-division duplexing is well known in the art.) In like manner as to codes, in a preferred embodiment, the limited set may comprise three frequencies, and up to two such closest frequencies may be determined.

The amount of separation required between frequencies (while also using code-division and time-division techniques) is dependent upon distance between the user stations **202** in each cell **203**, as well as upon the technique used for modulation and demodulation encoded signals. As is well known in the art, some modulation techniques allow for overlapping wideband signals whose center frequencies are offset by a minimum amount necessary to distinguish between otherwise cross-correlating signals. In a preferred embodiment, such modulation techniques may be used, allowing more efficient use of frequency spectrum and allowing frequencies to be reused at closer proximity.

Alternative Embodiments

While preferred embodiments are disclosed herein, many variations are possible which remain within the concept and scope of the invention, and these variations would become clear to one of ordinary skill in the art after perusal of the specification, drawings and claims herein.

For example, it would be clear to one of ordinary skill in the art, after perusal of the specification, drawings and claims herein, that other and further techniques, such as adjustable power control, cell sectoring, directional antennas, and antennae diversity, may be used to enhance a wireless communication system embodying the principles of the invention. Moreover, it would be clear to one of ordinary skill that a system also employing such other and further techniques would be workable, and is within the scope and spirit of the invention.

I claim:

1. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base station and said user stations communicate using time division multiple access;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned a second transmission frequency for transmitting to said base station for the respective first cell, said second transmission frequency not being assigned to any user station in any cell in said pattern of cells adjacent to said first cell.

2. The wireless communication system of claim 1, wherein said first transmission frequency is from a first set

comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency is from a second set comprised of a limited second predetermined number of frequencies, whereby said first set of frequencies is different than said second set of frequencies.

3. The wireless communication system of claim 2, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

4. The wireless communication system of claim 1, wherein said base station is dynamically assigned said first transmission frequency.

5. The wireless communication system of claim 1, wherein the user stations in said first cell are dynamically assigned said second transmission frequency.

6. The wireless communication system of claim 1, wherein transmissions between said base station transmitting to said first cell and the user stations in said first cell are time division duplexed.

7. A wireless communication system, comprising:

a pattern of cells;

one or more base stations; and

one or more user stations;

wherein said base stations and said user stations communicate using time division multiple access;

wherein a base station which transmits to a first cell in said pattern of cells is assigned a first transmission frequency for transmitting to said first cell, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned said first transmission frequency for transmitting to said base station which transmits to said first cell;

wherein the communications between said base station which transmits to said first cell and the user stations in said first cell are time division duplexed.

8. The wireless communication system of claim 7, wherein a user station in said first cell transmits data communication messages which include station identification information.

9. The wireless communication system of claim 7, wherein said base station which transmits to said first cell is dynamically assigned said first transmission frequency.

10. The wireless communication system of claim 7, wherein a user station is dynamically assigned said first transmission frequency when it enters said first cell.

11. The wireless communication system of claim 7, wherein said pattern of cells comprises a repeated pattern of cells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells is adjacent to another member of said first class of cells, no member of said second class of cells is adjacent to another member of said second class of cells, and no member of said third class of cells is adjacent to another member of said third class of cells.

12. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission frequency not assigned to any user stations in any cell in said pattern of cells adjacent said first cell;

wherein said base station is further assigned a first spread spectrum code for modulating radio communication for said first cell; and

wherein said user stations in said first cell are each assigned a second spread spectrum code for modulating radio communication from said first cell.

13. The wireless communication system of claim 12, wherein said first transmission frequency is from a first set comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency is from a second set comprised of a limited second predetermined number of frequencies.

14. The wireless communication system of claim 13, whereby the frequencies of said first set of frequencies are mutually exclusive of the frequencies of said second set of frequencies.

15. The wireless communication system of claim 13, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

16. The wireless communication system of claim 12, wherein said base station is dynamically assigned said first transmission frequency.

17. The wireless communication system of claim 12, wherein a user station is dynamically assigned said second transmission frequency when it enters said first cell.

18. The wireless communication system of claim 12, wherein each base station servicing said pattern of cells uses said first spread spectrum code for modulating radio communication for said pattern of cells and wherein each user station in said pattern of cells uses said second spread spectrum code for modulating radio communications from said pattern of cells.

19. The wireless communication system of claim 12, wherein said pattern of cells comprises a repeated pattern of cells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells is adjacent to another member of said first class of cells, no member of said second class of cells is adjacent to another member of said second class of cells and no member of said third class of cells is adjacent to another member of said third class of cells.

20. The wireless communication system of claim 12, wherein said first spread spectrum code and said second spread spectrum code comprise a set of codes with minimal cross-correlation attributes.

* * * * *

CLAIMS

I claim:

1. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base and said user stations communicate using time division multiple access;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned a second transmission frequency for transmitting to said base station for the respective first cell, said second transmission frequency not being assigned to any user station in any cell in said pattern of cells adjacent to said first cell.

2. A wireless communication system of claim 1, wherein said first transmission frequency is from a first set comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency is from a second set comprised of a limited second predetermined number of frequencies, whereby said first set of frequencies is different than said second set of frequencies.

3. The wireless communication system of claim 2, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

4. The wireless communication system of claim 1, wherein said base station is dynamically assigned said first transmission frequency.

5. The wireless communication system of claim 1, wherein the user stations in said first cell are dynamically assigned said second transmission frequency.

6. The wireless communication system of claim 1, wherein transmissions between said base station transmitting to said first cell and the user stations in said first cell are time division duplexed.

7. A wireless communication system, comprising:

a pattern of cells;

one or more base stations; and

one or more user stations;

wherein said base stations and said user stations communicate using time division multiple access;

wherein a base station which transmits to a first cell in said pattern of cell is assigned a first transmission frequency for transmitting to said first cell, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned said first transmission frequency for transmitting to said base station which transmits to said first cell;

wherein the communication between said base station which transmits to said first cell and the user stations in said first cell are time division duplexed.

8. The wireless communication system of claim 7, wherein a user station in said first cell transmits data communication messages which include station identification information.

9. The wireless communication system of claim 7, wherein said base station which transmits to said first cell is dynamically assigned said first transmission frequency.

10. The wireless communication system of claim 7, wherein a user station is dynamically assigned said first transmission frequency when it enters said first cell.

11. The wireless communication system of claim 7, wherein said pattern of cells comprises a repeated pattern of cells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells, no member of said second class of cells is adjacent to another member of said second class of cells, and no member of said third class of cells is adjacent to another member of said third class of cells.

12. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission

frequency not assigned to any user stations in any cell in said pattern of cells adjacent said first cell;

wherein said base station is further assigned a first spread spectrum code for modulating radio communication for said first cell; and

wherein said user stations in said first cell are each assigned a second spread spectrum code for modulating radio communication from said first cell.

13. The wireless communication system of claim 12, wherein said first transmission frequency is from a first set comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency if from a second set comprised of a limited second predetermined number of frequencies.

14. The wireless communication system of claim 13, whereby the frequencies of said first set of frequencies are mutually exclusive of the frequencies of said second set of frequencies.

15. The wireless communication system of claim 13, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

16. The wireless communication system of claim 12, wherein said base station is dynamically assigned said first transmission frequency.

17. The wireless communication system of claim 12, wherein a user station is dynamically assigned said second transmission frequency when it enters said first cell.

18. The wireless communication system of claim 12, wherein each base station servicing said pattern of cells uses said first spread spectrum code for modulating radio communication for said pattern of cells uses said second spread spectrum code for modulating radio communications from said pattern of cells.

19. The wireless communication system of claim 12, wherein said pattern of cells comprises a repeated pattern of ells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells is adjacent to another member of said first class of cells, no member of second class of cells is adjacent to another member of said second class of cells and no member of said third class of cells is adjacent to another member of said third class of cells.

20. The wireless communication system of claim 12, wherein said first spread spectrum code and said second spread spectrum code comprises a set of codes with minimal cross-correlation attributes.

21. A multiple user wireless communication system, comprising:

a plurality of cells;

a base station located in each cell;

wherein transmitters in a first cell are assigned a first code for modulating radio communication in said first cell;

whereby radio signals used in said first cell are spread across a bandwidth sufficiently wide that receivers in a second cell, said second cell being adjacent to said first cell, may

distinguish communication which originates in said first cell from communication which originates in said second cell;

whereby said first cell using said first code is not adjacent to any other cell using said first code;

wherein said base station transmits over a first frequency; and

wherein user stations in communication with said base station transmit over a second frequency different from said first frequency.

22. The multiple user wireless communication system of claim 17, wherein said base station communicates with said user stations using time division duplexing.

23. A wireless communication system, comprising:

a plurality of cells;

a base station; and

a plurality of user stations;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said plurality of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said plurality of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission frequency not assigned to any user stations in any cell in said plurality of cells adjacent said first cell;

wherein said base station and said user stations in said first cell are assigned one or more distinct codes for modulating radio communication for said first cell.

24. The wireless communication system of claim 19, wherein said base station is assigned a first set of one or more distinct spreading codes for communicating with user stations in said first cell, said first set of one or more distinct spreading codes not being assigned to any base station for communicating in any cell in said plurality of cells adjacent said first cell, and wherein said user stations in said first cell are assigned a second set of one or more distinct spreading codes, said second set of one or more distinct spreading codes not assigned to any user stations in any cell in said plurality of cells adjacent said first cell.

25. The wireless communication system of claim 19, wherein said base station communicates with said user stations using time division duplexing.

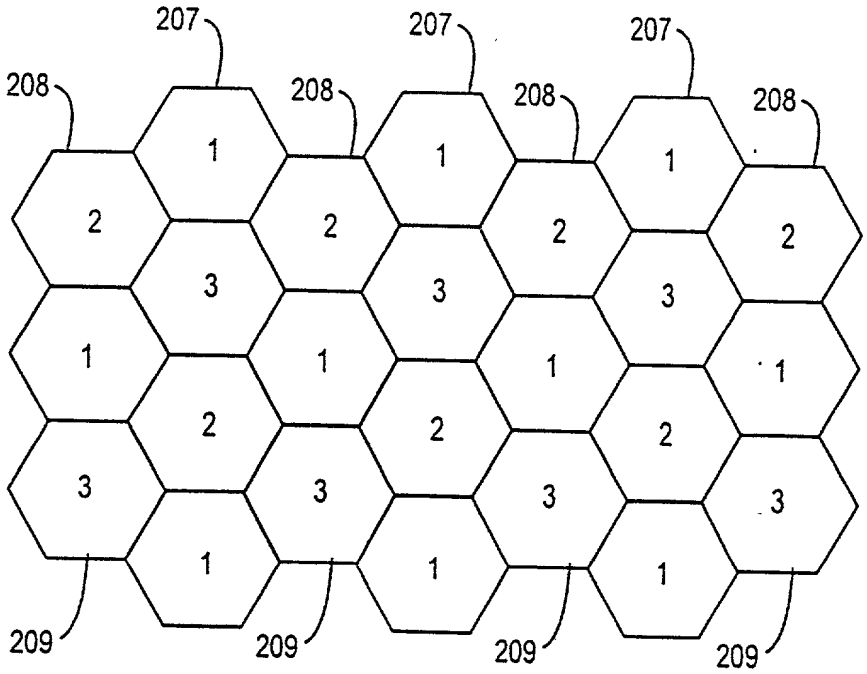


Fig.1

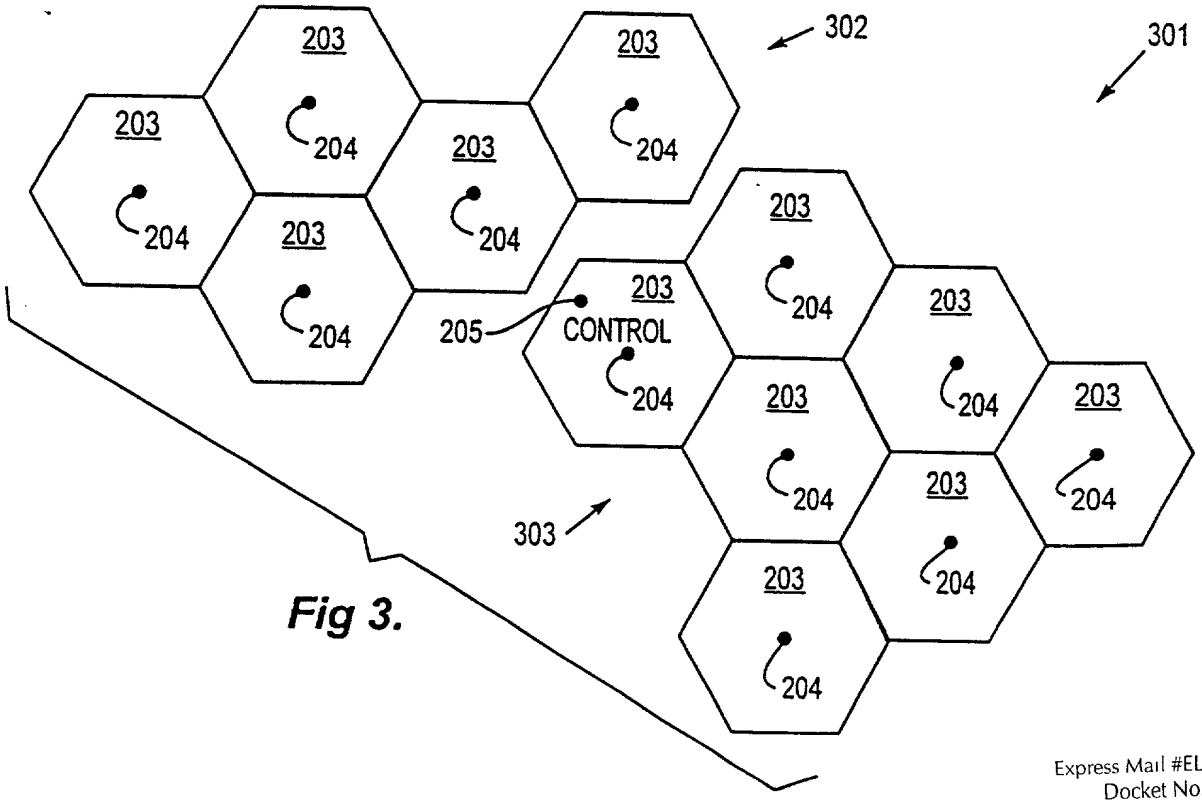
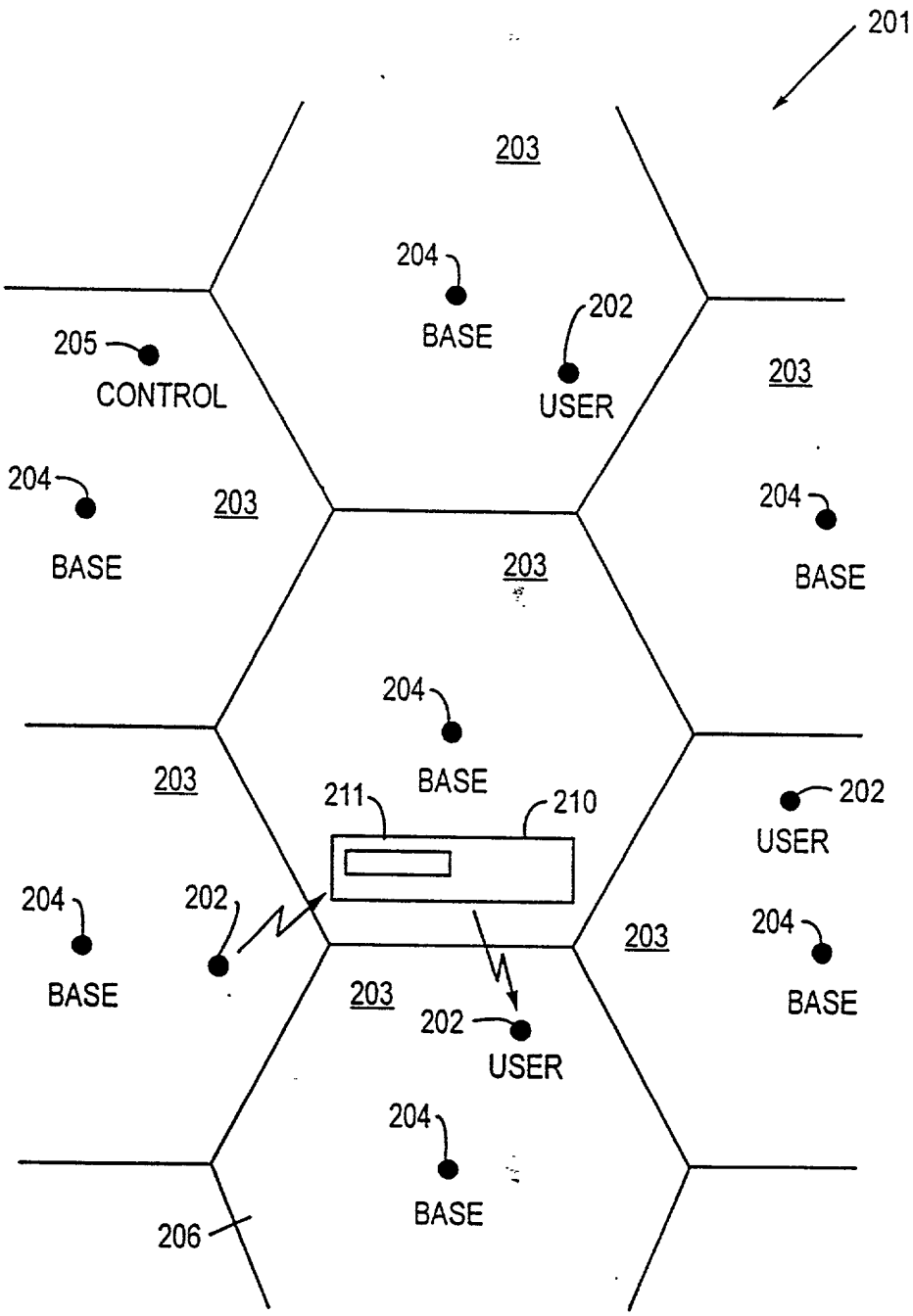


Fig 3.


201
203
204
BASE
202
USER
205
CONTROL
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204
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211
210
202
USER
204
BASE
202
203
204
BASE
203
202
USER
204
BASE
206

Fig. 2

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REISSUE APPLICATION DECLARATION BY THE INVENTOR	Docket Number (Optional) 226/132

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is described and claimed in patent number 5,850,600, granted 12/15/98, and for which a reissue patent is sought on the invention entitled Three Cell Wireless Communication System,
the specification of which

[X] is attached hereto.

[ ] was filed on _____ as reissue application number ___ / _____
and was amended on _____.
(If applicable)

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.
I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.
I verily believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below. (Check all boxes that apply.)

[ ] by reason of a defective specification or drawing.

[X] by reason of the patentee claiming more or less than he had the right to claim in the patent.

[ ] by reason of other errors.

At least one error upon which reissue is based is described as follows:

The attorney failed to appreciate the full scope of the invention and unduly restricted the invention by requiring that base stations in adjacent cells must each be assigned different frequencies for communication, and that user stations within adjacent cells have to also be assigned different frequencies for communication. The possibility of this error was first discovered after payment of the issue fee, but the attorney did not fully appreciate the proper scope of the invention until after conducting an investigation which was not completed until after the patent issued.

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(REISSUE APPLICATION DECLARATION BY THE INVENTOR, page 2)

Docket Number (Optional) 226/132

All errors corrected in this reissue application arose without any deceptive intention on the part of the applicant. As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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Country	U.S.A.				
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this declaration is directed.

Full name of sole or first inventor (given name, family name)
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Residence	Citizenship
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Full name of third joint inventor (given name, family name)

Inventor's signature	Date
Residence	Citizenship
Post Office Address	

☐ Additional joint inventors are named on separately numbered sheets attached hereto.